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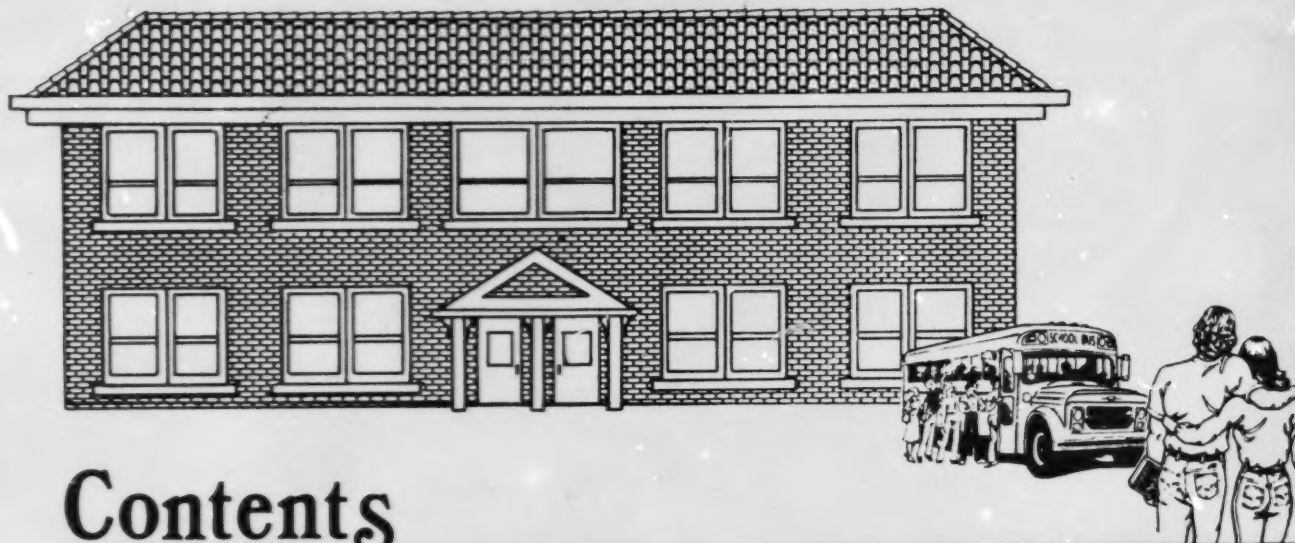
ABSTRACT

Beginning with a brief discussion of the importance of microcomputers in the school, this article explains their most common educational and administrative applications and summarizes the major activities of the College of Education at Arizona State University regarding microcomputers in education. The author outlines how microcomputers can be used for computer assisted instruction in the areas of drill and practice, tutorial programs, simulation activities, problem-solving, and games. Administrative applications of microcomputers discussed include computer management of instruction, such as preparation of Individualized Education Programs and student progress charts. Also mentioned is student record-keeping, such as the computerized gradebook and attendance records. Several activities undertaken by the College of Education are described, including a needs assessment study sent to Arizona school districts concerning their needs regarding computer assisted instruction. In response to the survey, the college initiated several computer-related activities. One is a laboratory containing six computers available to college students, faculty, and the general community. Another is the Computer Literacy Project, a summer workshop designed to teach teachers and administrators about computers. Another activity is a microcomputer conference to introduce elementary and secondary teachers and administrators to microcomputers. Finally, the College of Education offers classes on the use of computers. (Author/JM)

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INTERFACE

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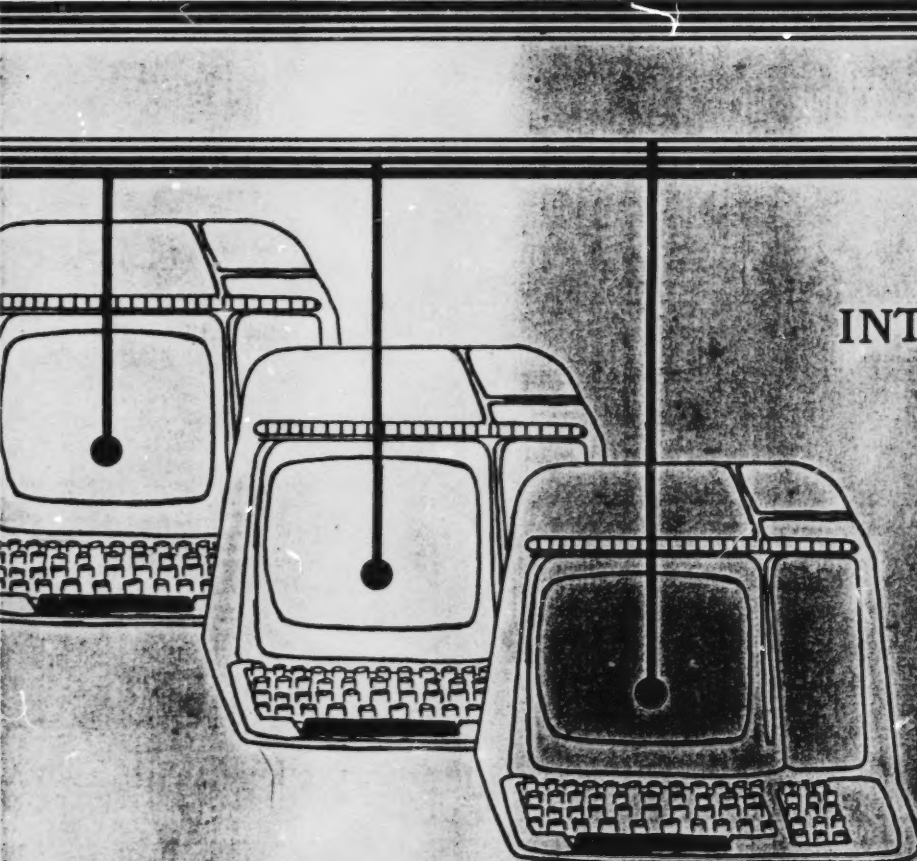
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Microcomputers

Go To School

by Dr. Gary G. Bitter

..school purchases
of microcomputers
will quadruple in'
the years 1978 to
1983..

INTRODUCTION

The Micro-electronic revolution of the last decade brought about an unprecedented reduction in the price of microcomputers. The effect has been that of providing highly sophisticated computer hardware within the budgetary limits of most school districts. In general, computers have invaded all our lives in some form or other. Therefore, we must bring awareness and knowledge of this technology to our lives. Schools, teachers, administrators, parents, and children have a definite need to become computer literate.

A recent study by the Creative Strategies, Inc., a market research firm, indicates that school purchases of microcomputers will quadruple in the years between 1978 and 1983. Their projections are that units purchased by schools, on a national basis, will grow dramatically from 26,700 in 1978 to 130,000 in 1983. Additionally, 70% of this demand will be from elementary and

secondary education. These projections indicate that microcomputers "can" potentially make a major contribution toward improving the present educational delivery system. Current statistics from the National Center for Education indicate that there are 50,000 computer systems in the schools. A breakdown of their information showed that 50% of the high schools and 14% of the elementary schools use at least one microcomputer or terminal for Computer Assisted Instruction (CAI).

Thus, a decade ago few computers were used in elementary and secondary education. Most of them were in the administrative offices performing the necessary functions of administrative tasks such as payrolls and record keeping. Very few were in the classroom for teaching

students about computers or how to program them. Now with microcomputers, even young children have the opportunity to interact with a computer. Children from grades three through twelve are learning to program them. And much larger numbers are being exposed to what computers are, what they can and cannot do, and how computers can be useful in helping many to do tasks better and more efficiently.

EDUCATIONAL APPLICATIONS

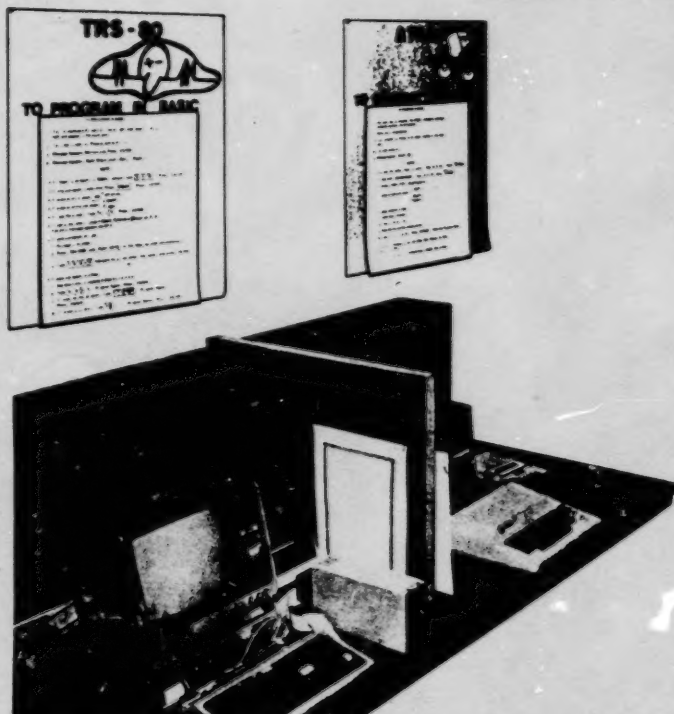
Microcomputers have many of the same capabilities of the larger mainframe computers and minicomputers. The major difference, of course, is that the larger ones can accommodate larger programs, larger amounts of data, and operate at much faster speeds. The speed of the mainframe is not essential for most classroom purposes and many of the record keeping activities at the school classroom or school site level. The following are the most common educational applications.

Computer-Assisted Instruction

CAI is the acronym for Computer Assisted Instruction. The most common approach is using programs that reproduce lessons of the practice and drill type. These programs are found in almost any subject matter - mathematics, science, reading, spelling, social studies, etc. They enable students to practice material that they may have learned but have not yet mastered. The computer is a far more patient teacher than any human teacher could possibly be. Also, the material is presented in a consistent manner. Some students need the repetition to firmly implant concepts into their mind. Another feature of CAI-type programming is the ability to teach the student only the material that has not been mastered. The material already mastered can be skipped over, saving the student time and avoiding boredom from going over material already learned.

Essentially, using a computer for drill and practice enables the computer to make a determination on the student's ability to learn new material or to master previously presented material. Based on the ability of the student, the program will branch to the routine(s) that will enable the student to receive help as needed in the amounts and types needed. With immediate feedback on one's own progress, the student is enabled to learn material that was missed in class or simply in the earlier portions of the computer program. Once again the computer is the patient, tolerant, nontiring teacher, that no human could ever hope to duplicate. No computer can replace a teacher, but computers can be of definite assistance to a teacher that has more students that need to be tutored than there is time to do an adequate job of individual tutoring.

..using programs that reproduce lessons of the practice and drill type..



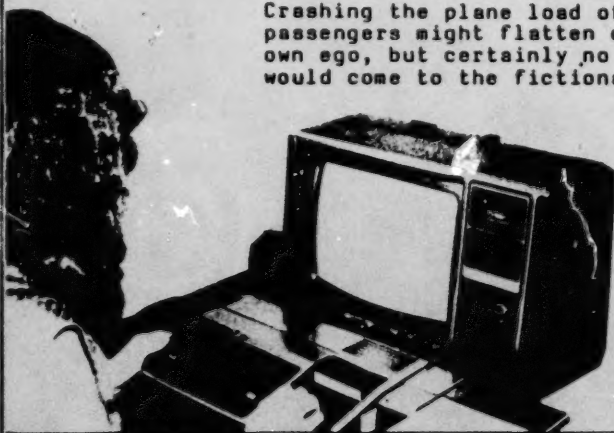
..tutorial programs to teach concepts..

Another role of the computer in education is through tutorial programs. Tutorial programs are characterized by the ability to teach concepts; for example, to teach how the heart works. While practice and drill programs are good for mastering material, they may have few tutorial or teaching techniques built into them. Graphics and sound capabilities of microcomputers make tutorial teaching via a computer a much more viable academic endeavor. Through carefully sequenced instruction and illustration, people of all ages can be taught concepts using the computer. Of course, this type of instruction is very expensive to develop and is presently quite limited in availability. Another feature of CAI tutorial programs is that the students are able to go at their own pace. The student is competing only with oneself and not with others. This obviously can boost one's self-awareness.

..application of computer simulation..

The computer can be used to simulate events in the world. This can be very useful and necessary for several reasons. Some concepts might be too dangerous for the students, teachers, or anyone else to get involved with directly. For example, one cannot expect everyone to get into an airplane and fly it without going through a lot of training. With simulation landing programs, one can land a Boeing 747 on a runway on the microcomputer. Crashing the plane load of passengers might flatten one's own ego, but certainly no harm would come to the fictional

passengers or crew. Another would be a simulation of a nuclear plant accident. The whole scenario could be done safely using a microcomputer. The students learn firsthand what happens, given a set of circumstances, without putting oneself or the general public's health in jeopardy. Some concepts are difficult to teach because of time loss. If one wanted to study the effects of genetics over several generations of humans, that would be an impossible task. By simulating the conditions in a computer, the results can be projected with a much clearer understanding of the processes involved. We can take a look into the future without actually being there, and perhaps in the process prevent potential dangers that might not otherwise be possible without the computer simulation. Another interesting application of computer simulation is the famous "lemonade" stand. Here, children can learn the concepts of economics at a level that they can understand, yet producing realistic consequences of the economic system. This duplication of an economic environment clearly would be impractical in the real world and actual solutions, as well as any predictions that would be generated. A computer may be programmed to calculate a loan. This is another example of CAI called problem solving. In this way, the computer can be used as a decision facilitator to determine whether or not to buy or rent a home. Having students write programs on math, science, social sciences, etc. is an effective use of the computer. In other words, programming the computer requires the student to understand the problem in order to get the computer to carry out the problem solving detail.

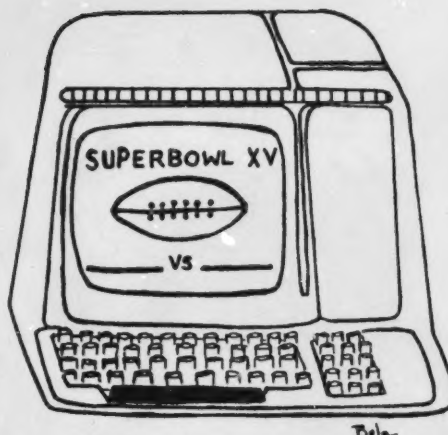


Games

Games are another computer use and can be for pure enjoyment, but educational value can also be gained with some computer games. Many students, especially learning-disabled students, need work in developing eye/hand coordination. Many games have this feature. This is especially true of the arcade-type games like pinball, "star wars", racing games, flight landing simulators, etc. If the games have graduated-ability levels, the youngsters (and some adults) can improve their coordination while thinking they are having fun. Strategy games require the person to apply logical reasoning for solutions. Some common games are known to all of us, like checkers or chess. Some versions will match the player against the user, while others provide choices of playing against another human opponent or the computer. Different levels of difficulty programmed into the game add educational challenges as well as personal enjoyment.

Administrative Applications

Administrative uses of computers occur both in the classroom and in administrative offices. The administrative offices have used computers for many years, especially in the larger districts from high school through college. One use of computers by the classroom teacher is for computer managed instruction. This is particularly true of teachers that have students in special education. Here teachers must prepare an Individualized Education Program (IEP) required by Federal law. The program is often times done by hand. Where it is done by computer, there is a much greater savings of time and effort on the teacher's part. Also, with a well planned



..games develop coordination..

IEP program to manage the instructional plans, the teacher is more apt to provide the right materials and programs that truly would make for the best program for each student. Other aspects of different computer management instruction sequences are simply a way of keeping track of the student's progress within a particular curriculum run on a computer system. The computer keeps track of the student's progress at all times and prepares reports for the teacher, indicating strengths and weaknesses. Thus, teachers have accurate records at all times enabling the instructor to plan appropriately for the student's progress.

..using computers for Individualized Education Programs (IEP)..

The second administrative function is one shared both by the classroom and school office. Though the programs may be different, the idea is the same - student record keeping. Every teacher must keep track of the student's grades in the classroom. In regular classrooms, most teachers have 30 or more students to keep track of in many different subject areas. With a computerized gradebook, the teacher has immediate access and knowledge of every student's

..computerized gradebook and attendance reports..

progress with the touch of a few key strokes on the computer. If a parent wants an immediate report of the progress, the teacher does not need to go into panic and spend a half hour just to calculate all the scores for one student. The computer gradebook can provide this information immediately. It can be a tremendous timesaver for any teacher. What's more, valuable information not otherwise available can be obtained with a good gradebook software package including class rankings, the scatter of grades, averages, test validity, etc. From the administrative side, there are attendance reports which need to be kept daily.

They are not only time-consuming but tedious. Also, absentee reports can more easily identify the chronically absent student. Finally, the administrative offices at the school building, school district, and higher-education levels have all the usual administrative tasks of running schools. Budgets may be prepared, expenditures recorded, salaries paid, Federal and State reports prepared, etc., etc.

Needs Assessment

In the Spring of 1980, a survey of the needs of the school educators of Arizona was initiated by the microcomputer study group of the College of Education at Arizona State University. The computer-assisted instruction needs assessment study consisted of a

questionnaire which was sent to every elementary and secondary school district in Arizona. Forty-six districts responded to this questionnaire. The study indicated that 37 of the responding districts were using microcomputers for instructional purposes. Fourteen more had future plans of utilizing microcomputers, but only a small percentage of students were actually involved in microcomputer-assisted instruction. The conclusion of the needs assessment follows.

- Software Availability: Seventy percent of all respondents indicated a desire to exchange information and software.
- Software Development: Sixty-five percent of all responding districts are interested in participating in cooperative software development projects.
- Teacher Training: Sixty-five percent of all districts that have or plan to have computer activities are interested in teacher-training workshops.

In response to the educational needs assessment survey, the College of Education initiated and supports several computer-related activities. The following is a summary of each activity.

THE MICROCOMPUTER LABORATORY

The College of Education Microcomputer Laboratory was developed in July 1980. Five microcomputers (now six) were placed in the Instructional Resource Laboratory for use by faculty and students in the educational programs, as well as being available to the public. The six computers are representative of education's most popular micros today. They are the APF, Apple, ATARI, Commodore PET, Radio Shack TRS-80, and Texas Instruments 99/4 with LOGO.



The Goals of the Microcomputer Laboratory are to:

- Provide support for courses already offered in the COE.
- Furnish opportunities for faculty to become familiar with characteristics of many different types of microcomputers.
- Be utilized for microcomputer research.
- Benefit the educational community.
- Act as a clearinghouse for computer programs.

The Microcomputer Laboratory is open to the general public on Tuesday, from 5 to 8 p.m. A graduate assistant is available during this time to assist the user. This laboratory gives teachers, administrators, and others an opportunity to preview the most common machines as well as to review much of the current software. Each of the computer systems have a growing library of software as well as a subject or topic directory of what is available. Most of the current software includes the academic areas of reading, math, science, social sciences, and spelling. Included in the library are simulations, drill and practice, and tutorial and game software. Brief teacher evaluations are available for the majority of software. In addition, the microcomputer laboratory can be reserved for teacher and administrator meetings, College of Education classes, and research activities. Several COE classes regularly use the facility.

TEACHING TEACHERS ABOUT MICROCOMPUTERS

Teaching teachers about microcomputers is another activity supported by the COE. Through a grant from the National Science Foundation, a Computer Literacy project was started in the Summer of 1981.

This program will continue through 1982 in the following three phases.

Phase I of the project involved school administrators from participating districts. This computer-literacy awareness session concentrated on computer literacy, introduction to microcomputers, discussions of opportunities for improvement of the educational delivery system brought about by microcomputer technology, and a summary of the most commonly used educational hardware. Also, there were hands-on demonstrations. In addition, the administrators helped to organize computer-literacy courses in their own district.

The second phase of the project was a four-week intensive study for 30 participants. These 30 participants are teachers of science education in grades 5 through 12. This study included general computer-literacy topics, different programming languages used with microcomputers in education, learning to program hardware, and software evaluation.

Ten teams were established to direct computer-literacy classes as part of Phase III. Each team developed a detailed computer-literacy class which will be offered during the 1981-82 academic year at ten different school districts. Each class will meet for 18 contract hours and provide district professional growth credit on their salary scale.

..lab offers opportunity to preview machines and software..



The topics covered will include computer literacy and introduction to microcomputers, the promise computers hold for improving effectiveness of instruction, introduction to BASIC, and hands-on experience for hardware/software evaluation.

The Phase II participants will teach the classes in their local participating districts in cooperation with faculty from the College of Education. Twelve classes are scheduled for the academic year. (Call 965-3322 for an 81-82 schedule.)

MICROCOMPUTER CONFERENCE

The College of Education conducted a microcomputer conference in January of 1980. The goal of "The Microcomputers in Education: Getting Started" conference was to introduce elementary and secondary teachers and administrators to microcomputers. The theme emphasized elementary education, secondary education, special education, administrative, and general interest sessions. The main speakers told about the challenge of the 80's: computer literacy, computer-assisted instruction in the basic skill areas at the elementary and secondary levels; applications for microcomputers in special and gifted education; evaluating microcomputer systems; hardware and software comparisons; career education and guidance information systems; instructional techniques for teaching the BASIC computer programming language to elementary and secondary students; designing computer proposals for Federal Funding; and microcomputers in the fine arts areas. The conference was attended by over 400 individuals. There were 55 speakers and 18 exhibitors. Another conference is planned for 1981. It is entitled, "Microcomputers in Education - Uses for the 80's." The conference, sponsored by COE,

will be held January 15-16, 1982 and will focus on: the microcomputer as a tool for instruction, the computer as a research instrument, and the microcomputer as an information manager. A variety of workshops, demonstrations, and exhibits will be offered as well as panel discussions and informal problem-solving groups.

COMPUTER EDUCATION CLASSES

The College of Education offers several classes on or related to computers. These classes emphasize computer literacy, computer-assisted instruction and/or programming. More courses are planned for the future. Topics covered will be PILOT, LOGO, word processing, graphics programming, advanced BASIC programming and techniques of computer use including simulations, problem solving, drill and practice, and tutorials. In addition, several classes incorporate the computer into the traditional class. These classes are regular offerings in Educational Psychology, Higher Education, Educational Technology, and Elementary Education.

CONCLUSION

This is a summary of the major commitments of the College of Education at Arizona State University to microcomputers in education. These avenues provide educators a start in utilizing the microcomputer in education. The microelectronic revolution is still in its infant stages and educators need to be aware of its strengths and weaknesses. If we can research and understand its implications, the future of microcomputers in education can be rewarding. Our charge is to determine the most educationally sound approach to harness this accessible and purposeful capability.

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